

the Hindu Kush, and through the terrible passes and defiles of Darél to the lower Swat Valley and to the monasteries and monuments of the Punjab.

It would have been interesting, too, if something of the northern art of Buddhist India had been illustrated, as well as the sculptures of Sanchi. It is in the north that the Greek influence is so marked in sculptural art as to render it quite distinct in character from the rude and riotous productions of the indigenous artist of the south, probably educated in Hindu schools.

But it is impossible within the limits of a popular historiette to compass more than a cursory account of so astonishing a moral phenomenon in the world's history as the rise of Buddhism and its marvellous outspread; or to present a view of Indian existence other than that which marked certain phases of its career. Prof. Rhys-Davids has done invaluable service in illustrating the earliest phase of Buddhist inception, and in giving to the world a far more lucid idea of the character of the three great Buddhist kings and heroes—Chandragupta, Asoka, and Kanishka—than is to be found elsewhere in the popular literature of the day. For it is only a great scholar who could have done this so well.

The work is scholarly throughout, as well as popular, and fully maintains the high standard of the fascinating series of "stories" of which it forms a noteworthy unit.

#### ACETYLENE.

*Acetylene: its Generation and Use.* By F. H. Leeds and W. J. A. Butterfield. Pp. x+276. (London: C. Griffin and Co., Ltd., 1903.) Price 5s. net.

THE steady advance made during the past few years by this beautiful illuminant fully justifies the production of the practical handbook which Messrs. Leeds and Butterfield have now placed before the public.

In this work they have described and explained the physical and chemical phenomena attending the generation and combustion of the gas, and also its employment in the various directions in which it has of late been used.

The subject is thoroughly dealt with, and the book contains an enormous amount of information and common-sense advice, the only general criticism that can be urged against it being, perhaps, that of the occasional repetitions which are inseparable from dual authorship.

In the introductory chapter, whilst considering the advantages of acetylene as an illuminant, the authors deal with a point which, up to the present, has been too much overlooked with regard to illumination by flames, and that is the importance of the action that these have in burning up and destroying considerable quantities of the organic impurities present in the air of an inhabited room, a function which is of the utmost importance, and the absence of which is a considerable factor in the unpleasant nature of the atmosphere often found in rooms lighted by incandescent electric lamps.

An interesting feature is also to be found in the authors' attempt to compare the relative merits and

cost of lighting by various illuminants on the basis of illuminating effect rather than illuminating power. That this difference does exist as a most important factor in illumination has long been recognised, and a moment's consideration will convince anyone that although a particular burner may yield a light of 25 candles, it will not be in any way equivalent in its power of effectively lighting a room to 25 candles distributed over the area of the room. If a satisfactory unit of comparison and an accurate method of determining the results could be obtained, this method of comparison would offer enormous advantages over the ordinary photometric method.

In compiling the table the authors have taken as the standard of a well-lighted room the being able to read with ease ordinary print in every part of it, but it is clear that so much depends upon the personal factor that whilst one observer may look up a train in Bradshaw with ease and comfort, another might find a difficulty in dealing with fair-sized print, and on such a basis it is hard to found a satisfactory unit of comparison.

In dealing with the physics and chemistry of the actions taking place between carbide and water in the generation of acetylene, the whole question is very carefully and thoroughly treated, but in referring to the power of water in dissipating the heat generated during the action, a little too much stress is laid on the power of water in keeping down the temperature. The statement that

"if an excess of water is employed in an acetylene generator the temperature inside can never, except quite locally, exceed 100° C. however fast the carbide be decomposed"

is although perfectly correct, a little misleading. The importance of reducing the temperature in an acetylene generator to the lowest possible point is to prevent the formation of certain compounds which afterwards give rise to trouble in the consumption of the gas, and with a large generator of the type in which carbide is fed into water, although the water may be in very large excess, it is by no means unusual to find in the centre of the decomposing mass on the bottom of the apparatus a temperature capable of melting lead, this being due to the fact that when the carbide is fed in in large quantities, a crust of lime forms on the outside of the mass which becomes toughened by tarry products formed by the heat on the acetylene generated in the interior of the mass, and this partly by acting as a non-conductor and partly by keeping the carbide away from the large excess of water, allows an undue rise of temperature, and the acetylene generated is found as a result to contain considerable amounts of products of polymerisation.

In referring to the combustion of acetylene and its illuminating power, the authors conclude that it would be clearer to state the illuminating power of acetylene as 48 candles per cubic foot, rather than by accepting the arbitrary nomenclature of gas photometry to speak of it as 240 candles, inasmuch as in determining the illuminating power, the gas has to be burnt at the rate best suited for developing its light-giving properties, and the results so obtained calculated to a consumption of 5 cubic feet.

It is not clear, however, that the statement of 48 candles per cubic foot would not be equally misleading, as the light emitted from good acetylene burners varies enormously with the rate at which the gas is consumed, so that with small burners the illuminating value of the gas is rarely more than 20 candles a foot, whilst with 1-foot burners it is a remarkably good burner that gives 42 candles per cubic foot of gas consumed.

In referring to the formation of carbonaceous growths at the burner tips, the authors point out that although this has been put down to the action of heat on polymerisation products in the acetylene, yet that if this were the case the trouble should disappear entirely if the gas were washed with heavy oil before entering the burners, this procedure, however, not giving entire freedom from the trouble. In this criticism, however, they evidently overlook the fact that not only does polymerisation of the acetylene take place where there has been undue heating in the generator, but that no matter how thoroughly the gas may be purified before reaching the burner, a further, though small, polymerisation will take place in its flow through the heated steatite tips at which it is burning, and that the trace of benzene so formed is quite capable of giving the trouble.

The practical details given as to size of pipes and other points upon which little or no knowledge exists amongst generator makers are of the greatest value, and the book may be most heartily recommended to all interested in the production and use of acetylene.

#### THE TSETSE FLIES.

A *Monograph of the Tsetse Flies (Genus Glossina, Westwood)*. Based on the Collection in the British Museum. By E. E. Austen, with a Chapter on Mouth-Parts by H. J. Hansen, Phil. Doc. Pp. ix+319. (London: Printed by Order of the Trustees, 1903.) Price 15s.

SOME fifty years ago J. O. Westwood gave a description of a "destructive species of dipterous insect known under the name of Tsetse," and referred it to the genus *Glossina*, first established twenty years previously by Wiedemann. From that time onwards references to the tsetse fly and its association with a mysterious disease fatal to horses, cattle, and other animals become very numerous in the writings of travellers and naturalists, and various were the theories propounded to explain the relation of the fly to the disease. Drysdale, in 1879, seems to have been the first to suggest that the tsetse fly disease might be of an infective nature, the infecting agent being conveyed by the bite of the fly. In 1895 and 1897 the well-known reports of Lieut.-Colonel Bruce appeared. He described the tsetse fly disease or nagana met with in Zululand, and established the fact that it is due to a protozoan blood parasite, the *Trypanosoma Brucei*, which is conveyed by the bites of the tsetse fly from affected to healthy animals. As horses and cattle are unable to exist in the districts inhabited by the fly, the problem of transport in these "fly belts" is a serious one, and the tsetse fly and its distribution

have assumed great economic importance. In India and Burma there is a similar, if not identical, disease known as surra, which is also conveyed by a biting fly perhaps a species of *Stomoxys*.

Within the last few months evidence has been accumulating, through the work of Castellani, Bruce and others, that sleeping sickness, the ravages of which have assumed alarming proportions, may be caused by a trypanosome (*T. Castellani*) attacking the central nervous system (see NATURE, vol. lxxviii. p. 116).

From analogy with nagana and other facts (see NATURE, vol. lxxix. p. 34) it would seem probable that a tsetse fly conveys the infection in this disease, and therefore that measures of prevention and extermination directed against the fly might stamp out sleeping sickness. Other diseases also, e.g. trypanosoma fever, are caused by species of trypanosomes, and these, too, may very likely be conveyed by tsetse flies.<sup>1</sup>

In view, therefore, of the practical importance of an accurate knowledge of the genus *Glossina*, the Trustees of the British Museum have been well advised to publish this monograph upon the tsetse flies, the preparation of which has been entrusted to Mr. Austen. We may say at once that Mr. Austen has produced a work which must for some time remain the standard one upon the subject. He gives both a popular and a scientific description of the flies, a full bibliography with copious abstracts, the whole being illustrated with many figures in the text, with a map showing the geographical distribution, with beautiful coloured plates of the seven known species from drawings by Signor Terzi, and with two plates of the mouth-parts of *Glossina* and *Stomoxys*. The latter, together with a description, are by Dr. Hansen, and will enhance the value of the volume to the dipterologist.

In the first place it is to be noted that, although the term "the tsetse fly" is usually employed, there are at least seven species, so that "tsetse" becomes a *generic* rather than a specific name. By some the original *Glossina morsitans* has been called the "true tsetse." The name "tsetse" is of obscure origin, but is certainly onomatopoeic, derived from the peculiar buzzing sound made by the fly on the wing. The tsetses are confined to Africa, are always met with in the neighbourhood of water, and are often restricted to peculiarly well-defined tracts of country. Mr. Austen's description of them may be reproduced here, since NATURE may reach many who may not have access to this monograph:—

"The tsetses are ordinary-looking sombre brownish or greyish-brown flies varying in length (excluding the proboscis) from  $3\frac{1}{2}$  to  $4\frac{3}{8}$  lines ( $7\frac{1}{2}$ –10 mm.) in the case of *Glossina morsitans* to about  $5\frac{1}{2}$  lines ( $11\frac{1}{2}$  mm.) in the case of *Gl. fusca* or *longipennis*, with a prominent proboscis in all species. The hinder half of the body, or abdomen, in the best known species, though not in all, is of a paler colour and marked with sharply defined dark brown bands, which are interrupted on the middle line; the abdomen, however, is invisible when the insect is at rest, as it is then concealed by

<sup>1</sup> Since the above was written, a further report on sleeping sickness by Col. Bruce has been issued. In this much additional evidence is given of the correctness of these views of the nature of sleeping sickness and of its transference by a tsetse. Trypanosoma fever may be the early stage of sleeping sickness.